~~Wright~~

~~FIR~~

LGL-3-7
1515

FORM 6200-8 (1/64)
UNITED STATES GOVERNMENT

Department of Agriculture — Forest Service
Region 1, Missoula, Montana 59801

Memorandum

SEP - 1 1965

TO : Chief
Attention: W. V. Benedict

File No. 5200

FROM : E. H. Juntunen, Assistant Regional Forester
Division of State and Private Forestry, By

Date: August 27, 1965

SUBJECT: Forest Insect Control

Your reference:

Enclosed are two copies of a preliminary report on the Douglas-fir tussock moth virus test in Idaho. We will submit the final report after adult emergence in the fall.

If you should have any questions, please let us know.

Enclosure: 2

cc: Region 4 (Honing) w/encl.
PNW w/encl.

[illegible] E. KETCHAM

RLK
KBW

1 Zerox copy to Thompson 9/1/65

[illegible] Exp. Sta.
[illegible]
RECEIVED

RECEIVED
AUG 31 1965
PNW Exp. Sta.

LGL-3-7
1516

5200

Missoula, Montana
August 27, 1965

PRELIMINARY REPORT ABOUT A PILOT TEST TO CONTROL DOUGLAS-FIR TUSSOCK MOTHS IN NORTHERN IDAHO WITH NUCLEAR POLYHEDROSIS VIRUS

1965

By
Scott Tunnock, Entomologist
Division of State and Private Forestry

INTRODUCTION

Periodic epidemics of the Douglas-fir tussock moth, Hemerocampa pseudotsugata McD., severely damage stands of Douglas-fir and true fir trees in the western American continent. Small infestations became apparent around private homes and farmyards near several towns in northern Idaho during 1961. By 1964, defoliation visible from the air covered about 70,000 acres in Benewah and Latah Counties, Idaho. Ground surveys in the fall indicated that various numbers of tussock moth egg masses could be found within the boundaries of a 300,000-acre area that extended into both counties. The potential hazard to these fir stands during 1965 from tussock moth feeding was very high.

DDT is the only tested insecticide, at present, highly toxic to tussock moths. Due to its unpopular side effects on other organisms, its replacement by another insecticide or biological control agent is being sought. A nuclear polyhedrosis virus has already been tested[1] and sprayed from the air to kill tussock moth larvae.[2] This material showed great promise as a tussock moth killer and needed further testing when applied from the air.

During June 1965, over 6,000 acres of watershed were treated with nuclear polyhedrosis virus to control the tussock moth population. About 1,000 of

---

1/ Morris, O. N., The natural and artificial control of the Douglas-fir tussock moth, Orgyia pseudotsugata, McD., by a nuclear polyhedrosis virus. Jour. Insect Path. 5(4) : 401-413, 1963.

2/ Washburn, R. I. and W. E. Cole, The use of virus to control tussock moth. Unpublished report, Div. For. Insect Res., Inter. For. and Range Exp. Sta., USFS, Ogden, Utah, 11 pages, 1960.

the 6,000 acres treated with virus were chosen as a pilot test area near Moscow, Idaho.

The main objectives of this operational-type pilot test are to:

1. Perfect a method for controlling tussock moth larvae other than with a chemical spray.

2. Develop methods in the laboratory for mass rearing of tussock moth larvae and inoculating them with virus, then processing polyhedral bodies from their cadavers.

3. Determine the effectiveness of applying 1 billion polyhedra per acre.

4. Develop a sampling method for determining the amount of mortality caused by introducing virus from the air.

The results in this report pertain to the number of Douglas-fir tussock moth larvae killed by polyhedrosis virus only in the pilot test area and unsprayed check areas up until August 13. Final results will not be available until after adult emergence in late September. Several other factors are causing additional mortality and will be included in the final report.

MATERIALS AND METHODS

Virus Source

About 40,000 Douglas-fir tussock moth larvae, which hatched from eggs collected in northern Idaho, were reared in the laboratory during the winter of 1964-65. They were fed larch and Douglas-fir foliage, and inoculated in the third instar by eating foliage dipped in water heavily contaminated with polyhedra. The inoculum was obtained from previously reared larvae which died of polyhedrosis probably contacted while emerging from contaminated eggs.

The number of polyhedra obtained from the 40,000 larvae (most died in the fifth and sixth instars) was enough to treat about 3,000 acres at the rate of 1 billion polyhedra per gallon of water per acre.

Spray Solution

Dead larvae were ground up in a Waring blender with some distilled water. The mash was then filtered three times and washed through with distilled water. The numbers of polyhedra per milliliter of this filtrate were then determined.

To mix 1 gallon of spray solution, ingredients in the following amounts were used:

0.90 gallon nonchlorinated water

0.10 gallon corn sirup

0.01 gallon fluorescent tracer

Enough milliliters of filtrate to provide 1 billion polyhedra per gallon of spray solution.

Treatment

A Hiller helicopter, which carried 70 gallons of spray solution, was used to treat the 1,000 acres in the pilot test area. It was calibrated to deliver 1 gallon per acre at 60 m.p.h.

Treatment began on June 16 at 5:30 a.m. It rained lightly for a few hours after 8:30 p.m. On June 17, after 200 acres were treated, it rained hard all day. Spraying was finished on June 19 and 20 with no rain.

White Kromekote cards were attached to all sample and check trees. These cards were collected each day and checked under a "black light" to determine how much spray, if any, had hit the tree.

Sampling

Fifty sample trees were established in the pilot test area. Two check areas were established. Twenty-five infested trees (Check "A"), 5 to 7 feet high, were removed a few weeks before treatment from various areas in the pilot test area and transplanted several air miles to the south. All egg masses were removed from the transplants. Prior to treatment, first and second instar larvae were collected from trees near where each transplant had been dug and liberated on that particular tree. The number of larvae per tree was based on an estimate of what each tree could feed. Twenty-five additional trees (Check "B") were located in an infested area about 1½ air miles south of the treatment area.

One week before the pilot test area was sprayed with polyhedra, five second instar larvae were collected from each sample and check tree. This was done by removing the perforated lid from a clear, 4-ounce, plastic cup, which contained a piece of artificial food, then holding the cup under a larva on the needles and knocking it in with a twig. Care was taken not to touch the inside of the cup or lid. The five larvae were selected at random from five different lower limbs on each tree.

Larvae were collected as above at 7-day intervals after treatment. The last collection was made at the end of 42 days.

Collected larvae remained in the plastic cups until they emerged as adults. The artificial food was replaced in each cup as needed. Sterile conditions were maintained during the transfer of food into the open cups. Captive larvae were checked daily to see if they had died or if food was needed. Cadavers were dissected to see if they contained parasites, and a slide was made of their crushed body contents to determine the presence of polyhedra or other organisms.

RESULTS

The prespray collections indicated approximately how much virus was present before treatment (table 1). Check "A" produced the lowest percentages, and mortality was consistently lower in this area for each collection. Conversely, mortality was consistently higher on Check "B". This is probably explained by population density. The number of larvae placed on the trees in Check "A" was considerably lower than on the sample trees or the trees in Check "B". However, the populations were about the same on the sample trees and on the trees in Check "B".

In all collections, mortality was greater on Check "B" than on the sample trees.

In all collections, mortality was greater on the sample trees than on the trees in Check "A".

The data in table 1 seems to indicate that the amount of prespray mortality by polyhedrosis influenced results more than the treatment of the sample trees with 1 billion polyhedra per acre.

Mortality from polyhedrosis on the sample trees and on the trees in Check "B" reached a peak 7 days after treatment, dropped, and then began to rise again.

Mortality increased on the sample and check trees as the season progressed. Mortality was consistently greater on Check "B" and lower on Check "A" than on the sample trees.

Table 1.--Percentage of Douglas-fir tussock moths killed by polyhedrosis within prespray and postspray collections

Item	Subject	Mortality from date of collection until August 13						
		Prespray	Postspray					
		6/13	6/26	7/3	7/9	7/16	7/22	7/29
Sample trees	Number of larvae collected	247.0	249.0	250.0	250.0	250.0	250.0	250.0
	Number killed	29.0	87.0	66.0	79.0	74.0	138.0	147.0
	Percentage killed	11.7	34.9	26.4	31.6	29.6	55.2	58.8
Check A	Number of larvae collected	1/110.0	110.0	110.0	110.0	110.0	2/100.0	3/90.0
	Number killed	8.0	27.0	27.0	29.0	28.0	40.0	47.0
	Percentage killed	7.3	24.5	24.5	26.4	25.5	40.0	52.2
Check B	Number of larvae collected	125.0	125.0	125.0	125.0	125.0	125.0	125.0
	Number killed	30.0	77.0	61.0	71.0	81.0	80.0	80.0
	Percentage killed	24.0	61.6	48.8	56.8	64.8	64.0	64.0
Checks A and B combined	Number of larvae collected	235.0	235.0	235.0	235.0	235.0	225.0	215.0
	Number killed	38.0	104.0	88.0	100.0	109.0	120.0	127.0
	Percentage killed	16.1	44.2	37.4	42.5	46.3	53.3	59.0

1/ Three out of the original 25 transplanted trees died.
2/ Two more transplants died, which left 20.
3/ Two more died, leaving 18.

DISCUSSION AND SUMMARY

Mortality increased on the sample and check trees as the season progressed. This illustrates either the rate of spread of the disease within the population or the time required for the larvae to accumulate a lethal dose of the virus.

Apparently, the addition of 1 billion polyhedra per acre did not significantly increase the amount of mortality in the tussock moth population over that caused by the natural virus.

The data from this pilot test will be more thoroughly analyzed in September following completion of the rearing. Other factors - such as weather, the amount of spray deposit on the trees, differences between plots, and the effects of natural virus - must be considered.